[0352] ANN node element functions can utilize a wide variety of appropriate activation functions including but not limited to:

[0353] Linear;

[0354] Threshold;

[0355] Sigmoid or symmetric sigmoid;

[0356] Logsig;

[0357] Tansig;

[0358] Stepwise linear approximation to symmetric sigmoid;

[0359] Gaussian or symmetric Gaussian;

[0360] Elliot.

[0361] ANN Training

[0362] ANNs require training in order to operate. Training results in establishing numerical values for a large set of ANN coefficient values that are used in the operation of the ANN. These sets of coefficients can be stored in firmware, volatile memory, a database, on the web, etc.

[0363] Ideally training will comprise a wide range of user data so as to accommodate a wide range of users. Alternatively, multiple ANN training session can be performed for various types of user hands and behaviors, and the HDTP system can adaptively match these to a particular user in a particular session.

[0364] ANN training can be implemented or utilized in one of more of a number of settings including but not limited to:

[0365] Pre-shipment training and calibration;

[0366] Field training and calibration;

[0367] User-specific training and calibration.

[0368] Training methods for the ANN can include a wide range of approaches, for example including but not limited to:

[0369] Adaptive gradient descent training method;

[0370] Adaptive gradient descent with momentum training;

[0371] Back-propagation training;

[0372] Batch training.

ANN training for an individual user or for a representative population of suragate users can, for example, comprise procedures such as those described earlier in conjunction with FIGS. **30***a*-**30***c*.

[0373] Other Uses of an ANN

[0374] ANN training can be implemented or utilized in one of more of a number of settings including but not limited to:

[0375] HDTP design;

[0376] Application design.

[0377] Alternatively, a trained ANN can be analyzed for partial or entire replacement with a collection of heuristics. Such heuristics can be devised as approximations to the trained ANN behavior. Additionally, an ANN can be used to fine tune or supplement an independently-derived collection of heuristics.

[0378] The terms "certain embodiments", "an embodiment", "embodiment", "embodiments", "the embodiment", "the embodiments", "one or more embodiments", "some embodiments", and "one embodiment" mean one or more (but not all) embodiments unless expressly specified otherwise. The terms "including", "comprising", "having" and variations thereof mean "including but not limited to", unless expressly specified otherwise. The enumerated listing of items does not imply that any or all of the items are mutually exclusive, unless expressly specified otherwise. The terms "a", "an" and "the" mean "one or more", unless expressly specified otherwise.

[0379] While the invention has been described in detail with reference to disclosed embodiments, various modifications within the scope of the invention will be apparent to those of ordinary skill in this technological field. It is to be appreciated that features described with respect to one embodiment typically can be applied to other embodiments.

[0380] The invention can be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

[0381] Although exemplary embodiments have been provided in detail, various changes, substitutions and alternations could be made thereto without departing from spirit and scope of the disclosed subject matter as defined by the appended claims. Variations described for the embodiments may be realized in any combination desirable for each particular application. Thus particular limitations and embodiment enhancements described herein, which may have particular advantages to a particular application, need not be used for all applications. Also, not all limitations need be implemented in methods, systems, and apparatuses including one or more concepts described with relation to the provided embodiments. Therefore, the invention properly is to be construed with reference to the claims.

1. A system for implementing a touch user interface, the system comprising:

a touch sensor providing tactile sensing data responsive to human touch made by a user to a touch surface disposed on the touch sensor;

at least one processor for performing calculations on the tactile sensing data and from this producing processed sensor data; and

at least one artificial neural network for performing operations on the processed sensor data to produce interpreted data,

wherein the interpreted data comprises user interface information responsive to the human touch made by the user to the touch surface.

2. The system of claim **1** wherein the touch sensor comprises a capacitive matrix.

3. The system of claim **1** wherein the touch sensor comprises a pressure sensor array.

4. The system of claim **1** wherein the touch sensor comprises a light emitting diode (LED) array.

5. The system of claim **1** wherein the touch sensor comprises a video camera.

6. The system of claim **1** wherein the artificial neural network has been previously trained to respond to touch data obtained from an individual user.

7. The system of claim **1** wherein the artificial neural network has been previously trained to respond to touch data obtained from a plurality of users.

8. The system of claim **1** wherein the interpreted data comprises the identification of at least one touch-based gesture made by the user.

9. The system of claim **1** wherein the interpreted data comprises a calculation of at least one numerical quantity whose value is responsive to the touch-based gesture made by the user.